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THE UNITED STATES OF AMERICA

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March 22, 2005

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APPLICATION THAT MET THE REQUIREMENTS TO BE GRANTED A
FILING DATE UNDER 35 USC 111.**

APPLICATION NUMBER: 60/553,104

FILING DATE: March 15, 2004

**By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS**



**P. SWAIN
Certifying Officer**

14230 U.S. PTO

PTO/SB/16 (08-03)

Approved for use through 07/31/2006. OMB 0651-0032

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV437642834US

19587 U.S. PTO
60/553104

031504

INVENTOR(S)

Given Name (first and middle [if any])	Family Name or Surname	Residence (City and either State or Foreign Country)
Mike	Brobston	Allen, Texas

Additional inventors are being named on the 1 separately numbered sheets attached hereto**TITLE OF THE INVENTION (500 characters max)**

COMMON RADIO ARCHITECTURE FOR MULTI-MODE/MULTI-BAND APPLICATIONS

Direct all correspondence to:

CORRESPONDENCE ADDRESS☒ Customer Number:

23990

OR

☐ Firm or
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ENCLOSED APPLICATION PARTS (check all that apply)

- | | |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Specification Number of Pages <u>3</u> | <input type="checkbox"/> CD(s), Number _____ |
| <input checked="" type="checkbox"/> Drawing(s) Number of Sheets <u>3</u> | <input checked="" type="checkbox"/> Other (specify) Certificate of Mailing By Express |
| <input type="checkbox"/> Application Date Sheet. See 37 CFR 1.76 | Mail; Fee Transmittal for FY 2004 |
| | (in duplicate); postcard receipt |

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. | FILING FEE
Amount (\$)

160.00 |
| <input checked="" type="checkbox"/> A check or money order is enclosed to cover the filing fees. | |
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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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| <input checked="" type="checkbox"/> No. | |
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[Page 1 of 2]

Respectfully submitted,

SIGNATURE

TYPED or PRINTED NAME John T. MocklerTELEPHONE 972-628-3600Date March 15, 2004REGISTRATION NO. 39,775

(if appropriate)

Docket Number: 2004.03.007.WS0**USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT**

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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Docket Number 2004.03.007.WS0

INVENTOR(S)/APPLICANT(S)		
Given Name (first and middle [if any])	Family or Surname	Residence (City and either State or Foreign Country)
Seong Eun Steven	Kim Loh	Plano, Texas Plano, Texas

[Page 2 of 2]

Number 1 of 1

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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$ 160.00

Complete if Known

Application Number
Filing Date
First Named Inventor Mike Brobston
Examiner Name
Art Unit
Attorney Docket No. 2004.03.007.WS0

METHOD OF PAYMENT (check all that apply)

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number 50-0208

Deposit Account Name Davis Munck, P.C.

The Director is authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☒ Credit any overpayments

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 770	2001 385	Utility filing fee	
1002 340	2002 170	Design filing fee	
1003 530	2003 265	Plant filing fee	
1004 770	2004 385	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	160.00
SUBTOTAL (1)			(\$ 160.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	X	
Multiple Dependent	-3** =	X	

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
1202 18	2202 9	Claims in excess of 20
1201 86	2201 43	Independent claims in excess of 3
1203 290	2203 145	Multiple dependent claim, if not paid
1204 86	2204 43	** Reissue independent claims over original patent
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$ 0

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	1053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for ex parte reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 420	2252 210	Extension for reply within second month	
1253 950	2253 475	Extension for reply within third month	
1254 1,480	2254 740	Extension for reply within fourth month	
1255 2,010	2255 1,005	Extension for reply within fifth month	
1401 330	2401 165	Notice of Appeal	
1402 330	2402 165	Filing a brief in support of an appeal	
1403 290	2403 145	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,330	2453 665	Petition to revive - unintentional	
1501 1,330	2501 665	Utility issue fee (or reissue)	
1502 480	2502 240	Design issue fee	
1503 640	2503 320	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 770	2809 385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 770	2810 385	For each additional invention to be examined (37 CFR 1.129(b))	
1801 770	2801 385	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

Other fee (specify)

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$ 0

SUBMITTED BY

(Complete if applicable)

Name (Print/Type) John T. Mockler Registration No. (Attorney/Agent) 39,775 Telephone 972-628-3600
Signature [Signature] Date March 15, 2004

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This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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DOCKET NO. 2004.03.007.WS0
Client No. SAMS01-00352
Customer No. 23990

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: : MIKE BROBSTON, ET AL

For : COMMON RADIO ARCHITECTURE FOR MULTI-MODE/MULTI-BAND APPLICAITONS

MAIL STOP PROVISIONAL PATENT APPLICATION

Commissioner for Patents
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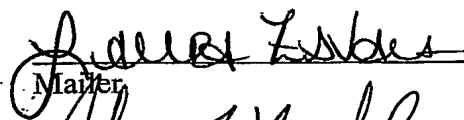
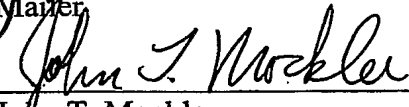
The undersigned hereby certifies that the following documents:

1. Postcard receipt;
2. Check in the amount of \$160.00 for the provisional patent application filing fee;
3. Fee Transmittal for FY 2004 (in duplicate);
4. Provisional Application for Patent Cover Sheet (in duplicate);
5. Specification (3 pages); and
6. Drawings (3 pages)

relating to the above application, were deposited as "Express Mail", Mailing Label No. EV437642834US with the United States Postal Service, addressed to: Mail Stop Provisional Patent Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on March 15, 2004.

Date: 3/15/04

Date: 15 March 2004


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INVENTION TITLE Common Radio Architecture for Multi-mode / Multi-band Applications

DESCRIPTION OF THE INVENTION

This description should be written in the Inventor's own words and should follow this guideline:

General purpose of the invention. State in general terms or summarize what the objectives of the inventions are. The proliferation of wireless access standards proves to be inconvenient and challenging for wireless terminal manufacturers. Further, end user expectations of a ubiquitous network cannot be met with terminals that support only a subset of the possible standards. In response, wireless systems are transitioning to the concept of a Software Defined Radio (SDR) to provide common hardware platforms for multiple air technologies. This SDR concept taking in mind its applications in handset / mobile terminals environment has to take into consideration factors like current consumption as well as lower component count to conserve board space. At the same time, it is the intention to achieve roaming among the supported standards and this challenges the SDR receiver to facilitate faster searches and handoffs.

Through continual advancement of semiconductor process technology, an increasingly greater percentage of these signal processing functions may be performed in reconfigurable hardware such as field programmable gate arrays (FPGAs) since these devices are capable of performing digital signal processing (DSP) functions at very high speed while consuming lower power than a traditional DSP processor. However, the current consumption does vary proportionately with the processing speed and to further reduce the power consumption of the SDR, this invention proposed a Near Zero-IF (NZIF) RF receiver frontend configuration to achieve a lower IF frequency and reducing the processing rate of the Digital IF (DIF) receiver.

The below described invention provides a method for achieving a lower sampling rate at IF by means of a NZIF RF receiver, while maintaining the Digital Signal Processing functions at IF. Further, typical embodiments of the design are discussed for clarity.

Description of the invention in detail (Including its operation, purpose, environment and how problems are solved).

The invention disclosed by this form puts in place a design that provides signal processing hardware up to IF frequency in a wireless terminal receiver that may be reconfigured to cater for multi-mode operations and a RF receiver frontend that performs a Near Zero IF down conversion using a broadband image reject downconverter. This invention also allows the implementation of a dual identical receiver for more efficient searching algorithm to facilitate roaming. Thus, as a user travels to regions that support varied wireless standards the same terminal can be used. The twin receiver architecture also permits remote reconfiguration of the IF filter and the IF.

Figure 1 illustrates a high level view of a wireless terminal. The Processor and Modem block are typically general purpose or semi-custom devices that can essentially change characteristics based on a new software load. It describes a broadband RF image reject downconverter that caters for multi-band operations bringing the input signal to near zero IF frequency to a configurable anti-alias filter before the ADC.

Figures 2 presents the 3 broadband LNAs and selection switches base on the band of operation or search as well as an IF frequency band with image rejection coming solely from the broadband mixer. Figure 3 describes the IF variable gain amplifier with both configurable BPF blocking filter and BPF anti-aliasing filter.

The general process can be illustrated with the example described hereafter. A PCS signal at the antenna will be selectively routed to the 1800MHz ~ 1900MHz band switchable gain LNA for signal amplification. A single image reject broadband mixer will downconvert the signal to an IF frequency of 10MHz. It will pass through a configurable Band Pass Filter (BPF) to remove interferers. A variable gain amplifier will adjust the signal to an optimized predetermined level for the ADC after another

The invention described in this invention disclosure is hereby submitted under my employment agreement with Samsung Telecommunications America, L.P..

Inventors Full Signature	Date	Inventors Full Signature	Date

Inventor(s): Submit to Jonathan E. Smith, Phone (972) 761-7608, Fax (972) 761-7601
The inventor(s) shall sign and date each page of the invention disclosure and any drawings.

configurable anti-alias BPF. The ADC can sample the signal at 40 MSps.

With the example embodiment and procedure described below, the disclosed invention achieves a multi-band, multi-mode receiver with optimize current requirement that is remote configurable, and capable of searching by signal strength measurements.

A primary feature of the invention is the use of a broadband NZIF RF receiver to achieve a low sample rate DIF design for current conservation. It is achieved using configurable BPF for necessary blocking and anti-aliasing functions. The image reject broadband high linearity mixer is a critical block in the RF design. This novel architecture allows the receiver to perform DSP functions like RSSI measurement for searching while optimizing the current.

An example receiver procedure for the wireless terminal in search mode:

- a) Base on an established search algorithm, the appropriate band LNA is selected via the switchplexer.
- b) The appropriate switch is activated to connect the single broadband image reject mixer to the selected LNA.
- c) The synthesizer sweeps through the channels for the band.
- d) The blocking BPF is configured through the score of predetermined channel bandwidths.
- e) Digital IF section reconfigures base on each mode such as GSM/GPRS/EDGE, CDMA, WCDMA, 802.11.
- f) The RSSI is determined after the Digital Channel Filter.
- g) Once determined that the signal strength exceeds the signal engaged at the primary receiver, the synthesizer is locked on to this channel.
- h) Modem performs mode identification and reconfiguring the anti-alias BPF.

3. Describe the prior art, method or performance, of the invention (Including any related publicly available documentation, such as journal articles or patents).

In the current state of the art, there are no known combinations of a NZIF RF with a DIF receiver. The lack of such prior art motivates the development of this combination platform. For instance, the state of wireless terminal development has been such that differing wireless standards required different hardware, and that the implementation of conventional Analog-to-Digital at higher frequencies for a configurable hardware proof too taxing on the current consumption budget.

Current design uses a ZIF platform that has the entire receiver frontend in analog. This configuration makes it impractical for the receiver to measure the receive signal strength that the baseband modem can use. Also, the direct downconverter designed in today's ZIF architecture is narrowband. Other intentions seek to digitize at RF frequency, which will also means higher current requirements. Therefore, a prime focus of the disclosed invention is to exploit the broad bandwidth image reject mixer design of the RF analog frontend to cater for multiple bands at lower current consumption, as well as the configurability of the IF filters and the digital IF operating at lower sampling rate and therefore lower current consumption.

What are the potential applications and/or markets for this invention?

Multi-mode and Multi-band Wireless Applications

What are the features that are believed to be new, novel and non-obvious?

A SDR terminal capable of providing wireless service in areas of varied air technologies with little or no network intervention. To that end the specifics required follow.

- 1) Wireless terminal whereby IF signal processing is performed with reconfigurable blocking and anti-aliasing filters.
- 2) Using a Near Zero-IF broadband RF to meet low processing rate of the Digital IF for low current consumption.

The invention described in this invention disclosure is hereby submitted under my employment agreement with Samsung Telecommunications America, L.P..

Inventors Full Signature	Date	Inventors Full Signature	Date

Inventor(s): Submit to Jonathan E. Smith, Phone (972) 761-7608, Fax (972) 761-7601
The inventor(s) shall sign and date each page of the invention disclosure and any drawings.

SAMSUNG

ELECTRONICS

**SAMSUNG TELECOMMUNICATIONS AMERICA, L.P.
INVENTION DISCLOSURE FORM**

- 3) A single broadband image reject mixer to drastically reduce external filters, and I/Os of ASIC resulting in an optimize package and die size.
- 4) Rf supports multi-band, and SDR supports multi-mode.

ketches, prints, photos and other illustrations, as well as reports of any nature in which the invention is referred to, if available, should form the basis of the disclosure and reference can be made in the description of the construction and operation of the invention.

<i>The invention described in this invention disclosure is hereby submitted under my employment agreement with Samsung Telecommunications America, L.P.</i>			
Inventors Full Signature	Date	Inventors Full Signature	Date

Inventor(s): Submit to Jonathan E. Smith, Phone (972) 761-7608, Fax (972) 761-7601
The inventor(s) shall sign and date each page of the invention disclosure and any drawings.

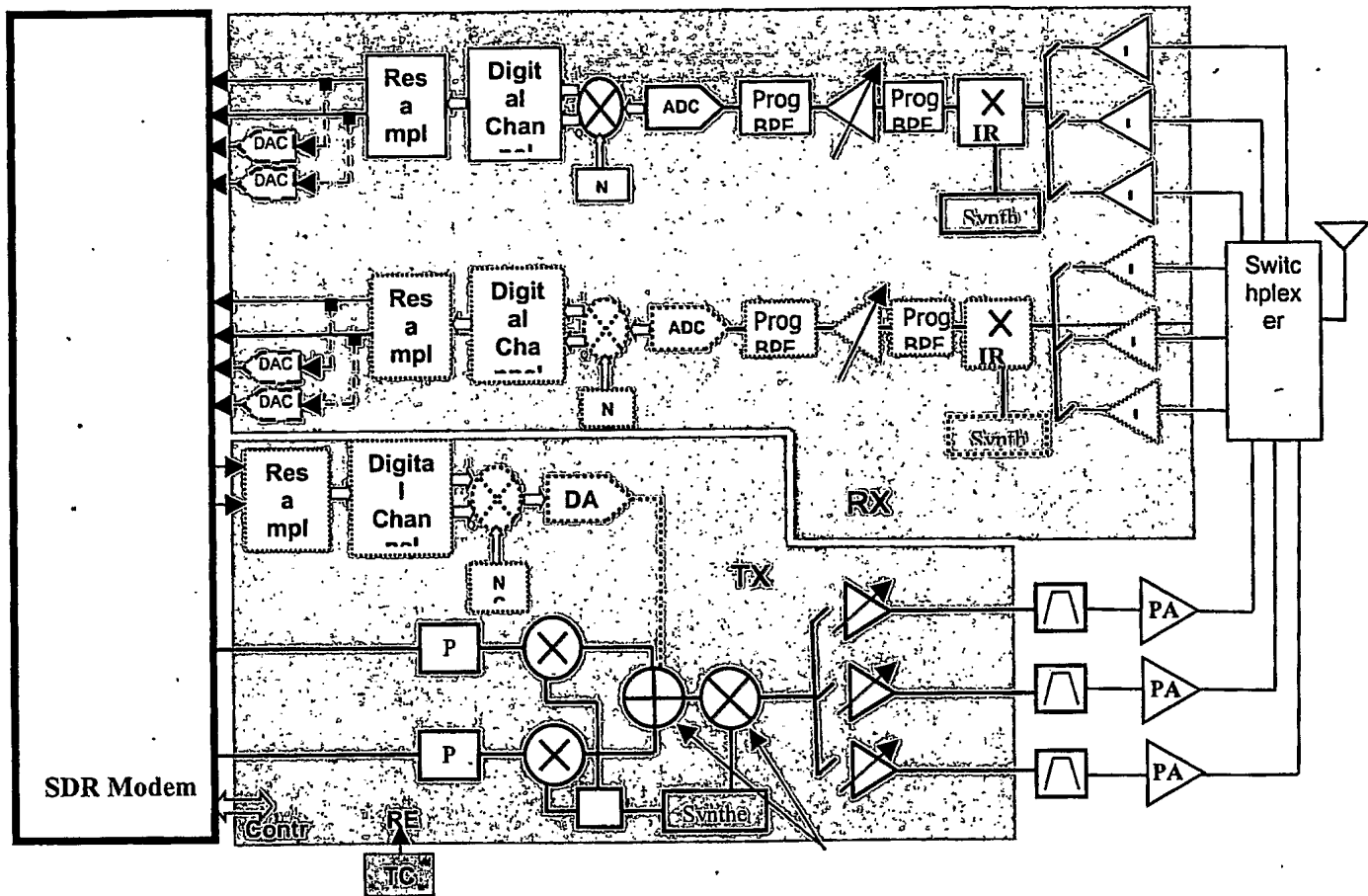


FIGURE 1

Typical Terminal Functionality

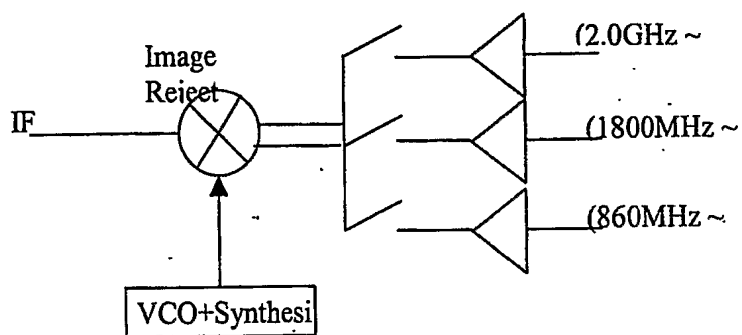


FIGURE 2

Broadband LNA and Image
Reject Mixer

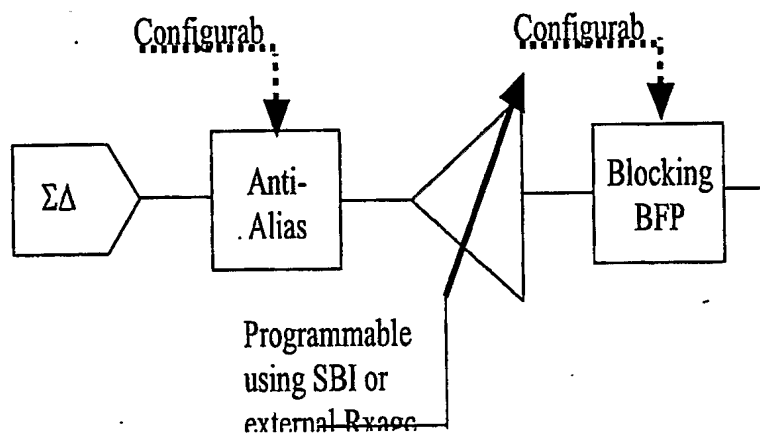


FIGURE 3

IF Variable Gain Amplifier
and Configurable BPF